

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:**

1. A method of screening for compounds that modulate stem cell differentiation comprising:
  - (a) identifying a modulator of caspase-3 activity by contacting a caspase-3 protein, or a cell expressing a caspase-3 protein, with a candidate compound, measuring the activity of the caspase-3 protein and comparing the measured activity with the activity of caspase-3 protein in the absence of the candidate compound, wherein a difference in the activities indicates that the candidate compound is a modulator of caspase-3 activity;
  - (b) contacting a population of stem cells with said modulator of caspase-3 activity to provide a treated population of stem cells;
  - (c) measuring the level of at least one marker of differentiation in said population of stem cells, and
  - (d) comparing the level of said marker in the treated population of stem cells with a control population of stem cells that have not been contacted with said modulator,wherein a difference in the levels of said marker indicates that the modulator is a compound capable of modulating stem cell differentiation.
2. The method according to claim 1, further comprising culturing said treated population of stem cells in differentiation media prior to step (c).
3. Use of a caspase-3 protein, or a polynucleotide encoding a caspase-3 protein, to screen for compounds that modulate stem cell differentiation.
4. A use of one or more compound that modulates caspase-3 activity to modulate differentiation of stem cells, wherein said one or more compound modulates caspase-3 activity by inhibiting or activating one or more component of the caspase-3 signalling pathway.

5. The use according to claim 4, wherein said one or more component is selected from the group of: pro-caspase 3, active-caspase 3, Mammalian Sterile Twenty-like kinase 1 (MST1), MEKK1, ASK1, SLK, MKK6, MKK3, p38 $\alpha$ , p38 $\gamma$ , XIAP, c-IAP2, c-IAP1, survivin, caspase-1, caspase-8, caspase-9, caspase-10, granzyme B, I- FLICE and CrmA.
6. The use according to claim 4 or 5, wherein said one or more compound increases caspase-3 activity and induces stem cell differentiation.
7. The use according to claim 4 or 5, wherein said one or more compound attenuates caspase-3 activity and inhibits stem cell differentiation.
8. The use according to claim any one of claims 4, 5, 6 or 7, wherein said stem cells are selected from the group of: muscle stem cells, cardiac stem cells, neural stem cells, cortical stem cells and bone marrow stem cells.
9. The use according to any one of claims 4, 5, 6, 7 or 8, wherein said stem cells are *in vivo*.
10. The use according to any one of claims 4, 5, 6, 7 or 8, wherein said stem cells are *ex vivo*.
11. The use according to any one of claims 4, 5, 6, 7 or 8, wherein said stem cells are *in vitro*.
12. A method of modulating stem cell differentiation comprising contacting a stem cell, or a population of stem cells, with one or more modulators of caspase-3 activity.
13. The method according to claim 12, wherein said one or more modulator of caspase-3 activity activates or inhibits one or more component of the caspase-3 signalling pathway.
14. The method according to claim 13 or 14, wherein said one or more component is selected from the group of: pro-caspase 3, active-caspase 3, Mammalian Sterile Twenty-like kinase 1 (MST1), MEKK1, ASK1, SLK, MKK6, MKK3,

p38 $\alpha$ , p38 $\gamma$ , XIAP, c-IAP2, c-IAP1, survivin, caspase-1, caspase-8, caspase-9, caspase-10, granzyme B, I- FLICE and CrmA.

15. The method according to any one of claims 12, 13 or 14, wherein said one or more modulator increases the activity of caspase-3 and induces stem cell differentiation.
16. The method according to any one of claims 12, 13 or 14, wherein said one or more modulator attenuates the activity of caspase-3 and inhibits stem cell differentiation.
17. The method according to any one of claims 12, 13, 14, 15 or 16, wherein said stem cell, or population of stem cells, are selected from the group of: muscle stem cells, cardiac stem cells, neural stem cells, cortical stem cells and bone marrow stem cells.
18. The method according to any one of claims 12, 13, 14, 15, 16 or 17, wherein said stem cell, or population of stem cells, are *in vivo*.
19. The method according to any one of claims 12, 13, 14, 15, 16 or 17, wherein said stem cell, or population of stem cells, are *ex vivo*.
20. The method according to any one of claims 12, 13, 14, 15, 16 or 17, wherein said stem cell, or population of stem cells, are *in vitro*.
21. The method according to any one of claims 12, 13 or 14, wherein said stem cell, or population of stem cells, are contacted sequentially with a modulator that attenuates the activity of caspase-3 and inhibits stem cell differentiation and a modulator that increases the activity of caspase-3 and induces stem cell differentiation.
22. A method for producing a pharmaceutical composition for modulating differentiation of stem cells comprising: identifying a compound by the screening method according to claim 1 and formulating said compound into a pharmaceutically acceptable form.